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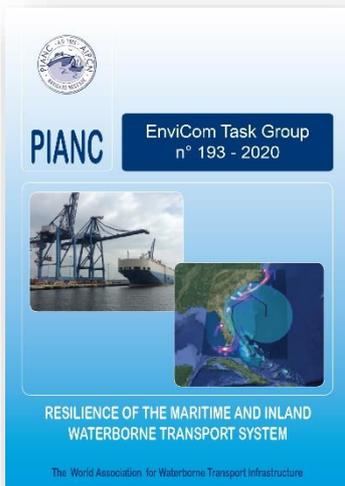
The World Association for Waterborne  
Transport Infrastructure

### Title: 'RESILIENCE OF THE MARITIME AND INLAND WATERBORNE TRANSPORT SYSTEM'

Author's: EnviCom Task Group 193

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#### Introduction:

Resilience is the capacity to anticipate and plan for disruptions, resist loss in operations and/or absorb their impacts, rapidly recover afterwards, and adapt to changing conditions and constraints. The properties of resilient systems are not new, but in the last decade, increases in the disruptions and constraints affecting the Maritime and Inland Waterborne Transport System (MIWTS) have prompted further investigation into how to incorporate them into research, management, and operations.

The global spread of a novel coronavirus in 2019 (COVID-19) highlights the critical importance of making sure that the MIWTS is prepared to provide the functions of moving goods and people throughout unimaginable interruptions and crises spanning from the environment, to infrastructure systems, labor relations, human errors, and public health. Ports and harbors must plan and adapt to both long-term disturbances, such as climate change, and short-term disturbances such as natural disasters and increasingly frequent and intense storms and flooding on inland waterways. If not adequately addressed, these disturbances can cause major national and international disruptions. However, proper planning and mitigation to minimize disruptions and speed recovery from these and other potential hazards and constraints will serve to increase the resilience of the MIWTS.

This report presents the results of Task Group 193's review of pertinent documentation, PIANC and third-party reports and publications, unpublished reports and tools, and the practical experience and expertise of the Task Group 193 members. The objective of this report is to provide an understanding of resilience of the MIWTS, summarize knowledge to-date, and highlight future needs through the definition of key terms and a series of case studies, and finally, identify best practices and resilience-related decision-support tools.

The report also describes the relationship between resilience and other systems management concepts including sustainability, risk, and vulnerability.

This guidance also:

- Identifies actions taken in the international community to build resilience.
- Identifies resilience indicators for the MIWTS and decision-support tools to enhance resilience.
- Provides an overarching guide for consideration of resilience with respect to the MIWTS
- Summarises resilience concepts and future needs for the MIWTS.

The report presents case studies that highlight how the MIWTS can achieve heightened resilience in each of the four phases of resilience: Plan/Prepare, Resist/Absorb, Recover, and Adapt. These 8 case studies of MIWTS resilience span four continents and present MIWTS responses and lessons learned to disturbances and stressors such as hurricanes, earthquakes, tsunamis, labor relocation, low water events, and climate change. The report also presents best practices regarding MIWTS infrastructure, environmental systems, pre-event planning and social capital, resilience in recovery, policy and funding, and community outreach. Requirements and methods of resilience decision-support tools are outlined, and 9 examples of existing tools are summarised.

**NOTE:** The objective of this report is to provide information and recommendations on good practice. Conformity is not obligatory and engineering judgement should be used in its application, especially in special circumstances. This report should be seen as an expert guidance and state of the art on this particular subject. PIANC disclaims all responsibility in case this report should be presented as an official standard.

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